

NUTRITION-RELATED CONDITIONS AMONG CHILDREN OF MIGRANT AND
SEASONAL FARMWORKERS IN THE UNITED STATES: CAUSES AND SOLUTIONS

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Abstract

The purpose of this literature review is to determine the prevalence of nutrition-related conditions among children of migrant and seasonal farmworkers (MSFW) compared to national averages, as well as effectiveness of strategies for minimizing any health discrepancies. MSFW live under harsh conditions, engage in long hours of physically demanding labor, and receive insufficient income. Compounding demographic characteristics create insurmountable barriers to quality health care and nutrition education resulting in disproportionately unhealthy children within the MSFW population as compared to the greater US population. The prevalence of overweight, obesity, diabetes mellitus, cardiovascular disease, and numerous infections is higher among MSFW children. Specialized health clinics have been developed to meet the unique needs of MSFW and their families. Mobility of health care professionals has allowed MSFW to receive care within a comfortable and familiar context and at an appropriate time of day. Community partnerships have created unity and momentum to promote change. Empowering and educating community members as translators and advocates has improved interactions between health care professionals and MSFW. Despite efforts of existing programs, most MSFW still receive no health care or nutrition education. Implementation of university students as respite care in MSFW clinics will increase the capacity of such clinics during the busiest times of the year. Further research is needed to better understand current strategies and their effectiveness as well as the MSFW population itself, especially on the West Coast.

Introduction

The purpose of this literature review is to determine the prevalence of nutrition-related conditions among children of migrant and seasonal farmworkers (MSFW) compared to national averages, as well as effectiveness of strategies for minimizing any health discrepancies. A migrant or seasonal farm worker is “an individual whose principal employment is in agriculture on a seasonal basis who has been so employed within the last twenty-four months” (Hansen & Donohoe, 2003, p. 154). MSFW harvest 85% of fruits and vegetables throughout the country and amount to approximately 1.4 million laborers (Hansen & Donohoe, 2003). When considering dependents, this approximation may approach 5 million individuals (Arcury & Quandt, 2006). More than half of MSFW reported a household income less than \$1,000 per month (Kilanowski, 2010), far below the US poverty line (United States Department of Health and Human Services [HHS], 2014). These individuals suffer numerous occupational hazards, subpar housing arrangements, and lack of access and availability to health care.

Across the United States, it has been observed that children consume minimal amounts of nutrient-dense foods such as fruits, vegetables, grains and fluid milk and have replaced these healthy options with overeating of energy-dense, nutrient-poor foods such as sugar-sweetened beverages, fried foods, and high sodium processed foods (Dietary Guidelines Advisory Committee [DGAC], 2010). Children of MSFW face even greater disadvantages inherent to the lifestyle of migratory agriculture which predispose them to further barriers to a healthy lifestyle. Cultural barriers, language difficulties, and physical seclusion create a toxic environment for children and adults alike. Because children have less mature immune systems, their developing bodies face a much higher risk of acute and long term conditions (Nichols, Stein, & Wold, 2013).

A description of the life of MSFW will be provided in order to understand the numerous and complex factors surrounding the health of the MSFW population. The prevalence of nutrition-related conditions among children of MSFW compared to national averages will be discussed. Various intervention programs designed to appease the discrepancies between MSFW children's health and the greater US population will be described and research analyzing the effectiveness of the programs will be summarized.

The Life of Migrant and Seasonal Farmworkers and Their Families in the United States

MSFW represent a unique group of people residing in the United States. While most are ethnically Latino, largely of Mexican descent, their culture and circumstances are quite different from that of other non-native Latinos living within US borders. Strict definitions dictate who does and does not qualify as a MSFW. Within the population of MSFW, individuals share many qualities including demographic characteristics, housing, and environment. MSFW face unique barriers to health care as well as other predispositions to disease.

Definitions

Estimates have shown that 1.4 million US farm laborers are MSFW (Hansen & Donohoe, 2003). When considering dependents, this estimate may easily double, although it is impossible to identify exact amounts due to lack of documentation and the migratory nature of these individuals (Arcury & Quandt, 2006). MSFW have been defined as “individuals whose principle employment is in agriculture, who have been so employed within the last twenty-four months” (Hansen & Donohoe, 2003, p.154). A slight distinction is that seasonal workers do not migrate to follow various agricultural crops, but only work in fields near to where they live (Arcury & Quandt, 2006). Seasonal farmworkers, representing two-thirds of the MSFW population, may also be referred to as “shuttle migrants” (Arcury & Quandt, 2006).

Demographics

According to a review by Hansen & Donohoe (2003), MSFW are predominantly male (80%) and 5% are minors under the age of 18. The median age of these individuals is 29 years, while 66% are less than 35 years old. The vast majority of the MSFW population is foreign-born (81%), with 95% born in Mexico and 84% Spanish-speakers. While the average education has been reported at the 6th grade level, at least 20% of MSFW are functionally illiterate in both their native tongue and English. A study published in 2007 reported that 52% of MSFW are married, 63% have children, but only 24% live with their children while laboring and migrating (Gentry et al., 2007). The legal status of MSFW are represented in Figure 1 below: 25% are US Citizens; 21% possess permanent residency; and 53% have no authorization to be in the country whatsoever (Arcury & Quandt, 2006). As previously stated, exact enumeration cannot be guaranteed due to lack of documentation and frequent migration.

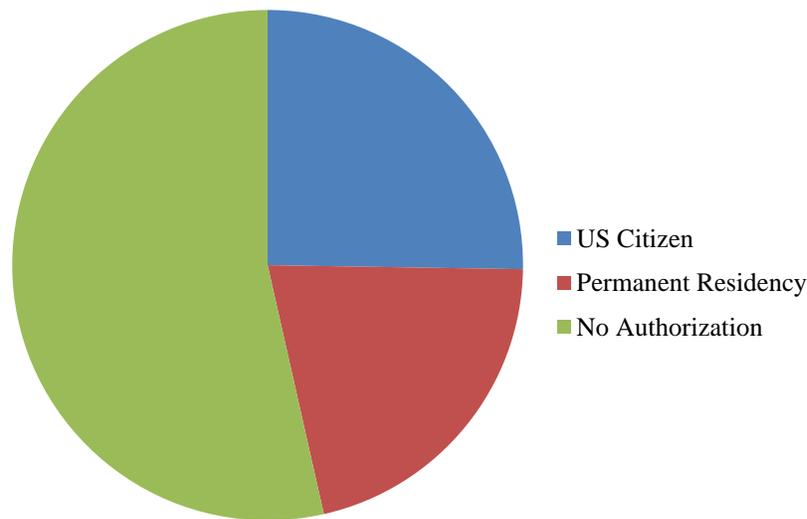


Figure 1: Legal Status of Migrant and Seasonal Farmworkers

Note: data from Arcury & Quandt, 2006

While the United States' agricultural industry reaped \$45.5 billion annually throughout the 1990s, the individuals working in the fields themselves scarcely earned enough to live (Hansen & Donohoe, 2003). Sixty-one percent of individual laborers and 50% of families reported incomes below the poverty line (Nichols et al., 2013). MSFW have a very humble approach to financial priorities: to sustain life by providing basic food, clothing and housing needs; and to send any extra earnings to family members within or without US borders (Connor, Layne & Thomisee, 2010). Unfortunately, even these goals are rarely realized.

Housing and Environment

Hansen & Donohoe (2003) reported that farm owners rarely provide sufficient on-site housing for MSFW. Almost 70% of field inspections by the Occupational Safety and Health Administration (OSHA) resulted in sanitation violations (Connor et al., 2007). Sixty-five percent of failed inspections occurred in fields where children live (Connor et al., 2007). The few housing units that are provided to MSFW often contain communal kitchens with limited resources: up to three stoves, one refrigerator shared between two or more families, and often malfunctioning appliances (Kilanowski, 2010; Kilanowski & Moore, 2010). Furthermore, 95% of farms employ less than 11 laborers and are therefore exempt from many OSHA laws (Hansen & Donohoe, 2003). Private housing alternatives in the surrounding area are not subject to federal regulations, are rarely of acceptable quality, and are far too expensive for MSFW to afford (Hansen & Donohoe, 2003). As a result, MSFW and their families often resort to sleeping in tents, vans, ditches, or open fields.

Kilanowski (2010) reported that MSFW camps and communities are often secluded from the broader community and hidden from public view. Many MSFW are undocumented and therefore live in fear of deportation. Because the dominant American culture and the MSFW

culture rarely blend, many MSFW never experience acculturation into American culture. Inability to communicate in English and misunderstanding of cultural norms, among other cultural inequalities, perpetuate the cycle of separation between the MSFW population and the greater community. As a result of this seclusion, many MSFW, especially single men, report isolation, heightened by geographic separation from loved ones during migration (Connor et al., 2010). The strain on the nuclear family and lack of support often lead to depression and chronic stress (Connor et al., 2010).

Midwestern growers reported that MSFW children are isolated from recreational playgrounds and equipment due to the remoteness of MSFW camps and communities combined with lack of transportation (Kilanowski, 2012). According to growers, the most common play space available to MSFW children was an open field (available to 42% of MSFW communities), followed by a basketball court (available to 18% of MSFW communities); 6% of growers reported that migrant camps had no access to play equipment or play space (Kilanowski, 2012). Despite the lack of provision of housing and access to play space, 80% of MSFW families expressed feeling safe in their homes and allowing their children to play in provided areas (Kilanowski, 2012).

Occupational Hazards

The agricultural profession that MSFW and their families are exposed to is very dangerous work. In 2000, 780 deaths and 130,000 disabling injuries were documented in agriculture alone (Hansen & Donohoe, 2003). Injuries ranged in severity from simple pains, sprains, cuts and tears to more serious dislocations, fractures and crush injuries (Arcury & Quandt, 2006). In 2006, the fatality rate among MSFW was 30% as compared to 4% among all other occupations (Connor et al., 2010). MSFW generally work 6 days per week from dawn until

dusk throughout peak harvesting and planting seasons with few breaks for meals or bathrooms (Connor et al., 2010). Furthermore, farm owners rarely provide food, water and bathrooms in the fields (Connor et al., 2010). MSFW must work regardless of extreme conditions including heat, cold, rain, and constant, unprotected sun exposure (Arcury & Quandt, 2006). Musculoskeletal disorders are also common due to stooping, lifting heavy loads, machinery and climbing (Hansen & Donohoe, 2003). Continuous pesticide exposure predisposes MSFW to respiratory illness, compromised reproductive health, and infectious diseases (Hansen & Donohoe, 2003; Arcury & Quandt, 2006; Nichols et al., 2013). Perhaps the most overlooked yet equally dangerous hazard faced by MSFW is the stress inherent in the occupation and lifestyle. Two thorough reviews reported that MSFW live in extreme poverty with poor housing conditions coupled with social, familial and geographic isolation, job uncertainty, time pressures, and lack of recreation (Hansen & Donohoe, 2003; Arcury & Quandt, 2006).

Predictors and Predispositions to Disease in MSFW Children

Due to the unique and challenging lifestyle of MSFW, children in this population are especially at risk of extensive nutrition-related conditions. The legal age of child agricultural labor is 12 years old while the majority of industries require child workers to be 16 years old (Hansen & Donohoe, 2003). Homelessness, frequent moves, poverty and lack of transportation (only 42% of MSFW drive or own cars) predispose MSFW children to many conditions not otherwise worrisome in the greater community (Hansen & Donohoe, 2003; Gentry et al., 2007; Arcury & Quandt, 2006; Wilson, Wold, Spencer & Pittman, 2000). Because 66% of MSFW children accompany their parents' migratory endeavors, interruptions and gaps in schooling are common. Many MSFW, including both adults and children, are functionally illiterate in English and Spanish (Connor et al., 2010).

Less than half of MSFW children meet minimum daily serving recommendations for vegetables, fruit and grains, putting them in danger of numerous micronutrient deficiencies (Kilanowski & Moore, 2010). Furthermore, most MSFW children receive routine immunizations later than recommended, if at all (Connor et al., 2010). Ultimately, predispositions to poor health care often begin in the womb. Only 42% of pregnant MSFW sought prenatal care during the first trimester of pregnancy, while 76% of expectant mothers across the United States received care during this crucial phase of fetal development (Connor et al., 2010).

Barriers to Care

MSFW and their families face diverse barriers to receiving health care. There is a severe lack of health professionals and health care available to MSFW. Much of the southeastern US has been deemed a Health Professional Shortage Area. In these counties, there is only one physician per 3,500 individuals in the population (Connor et al., 2010). These counties cannot meet the medical needs of the population. MSFW have little to no knowledge of the few health services available to them. Furthermore, they do not have sufficient insurance to utilize general health care facilities not specifically designed to serve MSFW.

The language and cultural barrier between MSFW and the greater US population heavily impedes MSFW from receiving necessary care. Connor et al. (2010) discovered that only 24% of MSFW self-identified as competent English-speakers. Inability to dialogue with health care providers nullifies any potential access to health services. Utilizing health services is further challenging because MSFW and their children heavily depend on crew leaders for transportation and work hours (Wilson et al., 2000). Individuals rarely recognize symptoms and health problems until the condition negatively affects work performance, yet fear of lost wages and lost

jobs may cause parents to delay seeking healthcare for themselves or their children even when a condition becomes obvious (Wilson et al., 2000).

Many MSFW feel uncomfortable seeking health care in the United States. Gentry et al. (2007) discovered that 50% of MSFW families receive some level of health care in Mexico rather than the US. Furthermore, satisfaction among parents whose children received health care in Mexico was much greater than among parents whose children received health care in the US (Arcury & Quandt, 2006). Many Latinos utilize drug stores run by other Latinos called *Tiendas* to buy over-the-counter and traditionally prescription medicine rather than going to a doctor or clinic (Gentry et al., 2007). *Tiendas* are almost impossible to track due to their mobile nature and clientele. Despite numerous factors that seem to block MSFW families from seeking health care in the US, illness encourages these families to seek out care (Arcury & Quandt, 2006).

Common Health and Nutrition Issues among US Children: Prevalence in MSFW Children versus the General Population

The various aspects and characteristics that encompass the life of MSFW intrinsically create an unhealthy environment. Many factors impact the health of MSFW and their families, especially children. The outcome is often negative, resulting in increased prevalence among children of MSFW as compared to the general population.

Access to Healthcare

Access to care can be defined as “the degree to which individuals are able to obtain needed health care” (Weathers, Minkovitz, O'campo & Diener-West, 2004, p. e276). While poverty and a lack of insurance have been shown to predispose children to experience unmet needs for medical care, children of MSFW suffer unmet needs at a disproportionately high percentage (Weathers et al., 2004). Unmet need for medical care can be defined as “the number of times over the past year the caretaker felt that the child needed medical care but could not

receive it” (Weathers et al., 2004, p. e277). In 2004, a survey was administered to 300 MSFW families in four counties in North Carolina. Over half (53%) of families surveyed reported their child experienced an unmet medical need for medical care within the last year as compared to only 2.2% of US children overall, according to the CDC (Weathers et al., 2004). Prompted by this great disparity in access to healthcare, Weathers et al. (2004) designed a cross-sectional household survey in order to identify correlates of unmet needs for medical care among migrant children.

One hundred addresses in four different counties county in North Carolina were randomly selected using a random-number-generator. After screening to ensure that migrant workers occupied the residence, three hundred migrant families were selected to participate in the study. One child in the family under age 13 years was randomly selected to be considered as the unit of analysis for that household. Face-to-face interviews concerning the selected child were conducted with the child’s primary adult caretaker using a 40-item questionnaire specifically developed for this study. All data were collected during peak harvesting season, a 2 ½ week period. Data were analyzed utilizing multivariate logistic regression models. Unmet need for medical care was determined by inquiring of the child’s primary caretaker (Weathers et al., 2004). Various factors were associated with an increase in children’s unmet need for medical care including preschool age, high caretaker pressure work, and dependence for transportation. Almost three-fourths of children (73%) lacked health insurance (Weathers et al., 2004). In contrast, the US Census reported that in 2013, less than 10% of children under age 18 lacked health insurance (Smith & Medalia, 2013).

One of the most prominent factors identified through this study was lack of transportation. Children whose families depended on outside resources for transportation were

almost twice as likely to suffer unmet medical needs (Weathers et al., 2004). Furthermore, one multiple logistic regression analysis revealed that children three to six years of age and children whose caretaker(s) faced very high pressure to work were two and six times more likely, respectively, to face an unmet need for medical care as compared to children outside three to six years old and children whose parents do not feel very high pressure to work (Weathers et al., 2004). Other notable factors included: child bed-days due to illness (minimum half day spent in bed), lack of well-child or dental exam within one year, female gender, age less than 5 years, and caretaker fear of job loss (Weathers et al., 2004).

This study revealed several factors that impact unmet medical needs among migrant children. High study power (0.90) and very low amounts of missing data items (4%) increased the strength of the study (Weathers et al., 2004). However, the study faced many limitations. Parental reports of children's health status and unmet needs may be skewed and biased, yet no direct observations were conducted (Weathers et al., 2004). Selection bias may have been an issue due to elimination of geographically isolated families (Weathers et al., 2004).

Access to Food and Food Security

Lack of access to and availability of food contribute to food insecurity among the MSFW population. As defined by Kilanowski (2010), "a household is considered food secure when its members do not live in hunger or fear of starvation" (p. 397). While the USDA reported that 82% of American families were food secure in 2004, a survey among 58 Midwest MSFW reported only 45% of families were food secure in 2008 (Nord, Andrews, & Carlson, 2006 & Kilanowski, 2010). Furthermore, 13% reported low food security, and 3% reported very low food security (Kilanowski & Moore, 2010). Food insecurity may lead to weight gain in both girls and boys, especially due to the substitution of low-cost, energy-dense foods for more

nutritious, expensive foods, as well as lack of fruits and vegetables (Kilanowski, 2010). A range of traditional and nontraditional food choices may be present in a food insecure household. Over 90% of very low food secure households reported an array of traditional foods including corn tortillas, white rice, and beans as well as nontraditional foods including hot dogs, ice cream and other sweets (Kilanowski & Moore, 2010).

According to a mail survey sent to growers in the Midwest, 87% of farm owners allowed MSFW to carry foods home from the fields, whether in limited or unlimited amounts (Kilanowski, 2012). However, limited options, seasonality of harvested food, and lack of transportation do not provide sufficient nutrition to MSFW. Throughout the United States, nutrient-dense foods such as fruits, vegetables, grains and fluid milk have been replaced with overeating of energy-dense, nutrient-poor foods such as sugar-sweetened beverages, fried foods, and high sodium processed foods (Arcury & Quandt, 2006). Similarly, MSFW struggle to provide a balanced diet for themselves and their families, especially given that some farms may be up to twenty-six miles from the nearest grocery store or market (Kilanowski, 2012).

Obesity

Not only are US children eating unhealthy foods, but they are overeating these high calorie options without engaging in an appropriate level of physical activity (Arcury & Quandt, 2006). This combination creates a trend toward obesity. Table 1 displays the prevalence of obesity in children among various age groups in the United States from 2011-2012 and among MSFW children in 2000. Prevalence of overweight and obesity has steadily increased over the last 30 years, disproportionately among ethnic minority groups (Arcury & Quandt, 2006). Obesity rates in 2011-2012 were highest among Hispanic youth (22.4% prevalence), followed by

non-Hispanic black youth (20.2%), and least prevalent among non-Hispanic white youth (14.1%) (Ogden et al., 2014).

Table 1. Obesity among Children

Group	% Obese ^a
Migrant and seasonal farmworker children ages 2-19^b	41
US children ages 2-19^c	17
US children ages 2-5	8.5
US children ages 6-11	18
US children ages 12-19	20.5

^a Obese defined as body mass index (BMI) at or above the 95th percentile on the sex-specific Centers for Disease Control and Prevention (CDC) 2000 growth charts.

^b Note: data from Arcury & Quandt, 2006

^c Note: data from Ogden, Carroll, Kit & Flegal, 2014.

Although obesity is largely on the rise, based on most recent studies by the CDC, some US populations have recently experienced decreases in prevalence of obesity (Ogden et al., 2014). Among children aged 2-5 years, prevalence decreased from 14% (2003-2004) to 8% (2011-2012). Prevalence of obesity has also decreased among low-income preschool-aged children benefitting from federal nutrition programs. Although some changes have occurred between the 2003-2004 NHANES report and the 2011-2012 report, national obesity prevalence is still high and must continue to receive attention from public health professionals. Prevalence of obesity and overweight among MSFW children continues to steadily increase (Kilanowski, 2010; Nichols et al., 2013). However, MSFW Children have a higher incidence of overweight, obesity, and diabetes mellitus as compared to US children at large (Kilanowski & Moore, 2010; Wilson et al., 2000).

Dental

According to a public health report in Yakima, Washington, MSFW children experienced 150-300% more dental caries and decayed teeth than non MSFW children (Hansen & Donohoe, 2003). On average, MSFW children have three dental caries while half have at least one. Untreated dental issues such as these drastically increase the risk of periodontal problems in adulthood (Wilson et al., 2000). Data collected from adult MSFW in Colorado and Illinois discovered that almost 70% of workers suffered at least one adverse dental condition (Arcury & Quandt, 2006).

Other Health and Nutrition-Related Conditions

In 2006, over 40% of MSFW surveyed in North Carolina reported eye pain largely due to pesticides and sun exposure (Arcury & Quandt, 2006). Those surveyed also complained of redness (43%), itching (25%), and blurred vision (13%). Corneal overgrowths, called pterygiums, may develop as a result of unprotected sun exposure and result in impaired or lost vision if not cared for properly (Connor et al., 2010).

Excessive sodium intake combined with inadequate potassium intake predisposes children to high blood pressure which can lead to cardiovascular disease (Dietary Guidelines Advisory Committee [DGAC], 2010). According to two surveys administered in 2000 and 2010, MSFW children experienced extremely elevated blood pressure as compared to US Children among ages 6-17 years (Wilson et al., 2000; Connor et al., 2010). Additionally, among thousands of MSFW children who received care from MSFW clinics in Georgia ages 4 weeks to 21 years old from 1995 to 2000 experienced much higher rates of anemia compared to US Children (Wilson et al., 2000).

Less mature immune systems cause children to experience more pesticide poisonings, respiratory and communicable diseases than adult MSFW. Pesticide exposure increases the relative risk of developing cancer in adulthood (Nichols et al., 2013; Hansen & Donohoe, 2003). Furthermore, MSFW children experience stunting, parasitic infections, skin infections, tuberculosis, foot fungus, chronic diarrhea, and vitamin deficiencies at a higher rate than the general US population (Nichols et al., 2013; Hansen & Donohoe, 2003; Arcury & Quandt, 2006; Wilson et al., 2000).

Interventions to Minimize Nutritional Disadvantages of Migrant and Seasonal Farmworker Children

Given the vast challenges inherent in the lifestyle of MSFW and their families, numerous nutrition-related conditions are expected. Public health officers, health care professionals, and community members have taken note of the disproportionate prevalence of various conditions among MSFW and have begun to develop programs and interventions designed to minimize the chasm between the need for health care and accessibility and availability of quality care.

Programs and Strategies

Programs should capitalize on the innate strengths in MSFW culture including resiliency and protectiveness, strong social and familial commitment, and a deep-seated desire to benefit the community over the self (Bauer & Kantayya, 2010). Practically, this can be executed in a variety of ways, many of which are already being employed in communities across the country. Approximately 400 federally authorized sites for migrant health care exist in the United States, along with many more not recognized by the federal government (Nichols et al., 2013). However, these centers currently reach only 12% to 15% of the MSFW population (Nichols et al., 2013).

One program that has been in effect for over fifteen years in Atlanta, Georgia is the Farm Worker Family Health Program. Connor, Layne & Thomisee (2010) critically analyzed the FWFHP strategy to immerse undergraduate students studying health professions into MSFW health clinics in order to increase the clinic's capacity to care for MSFW and their families. The FWFHP provided a two-week immersion experience for university students in which students broadened their understanding of their diverse community and experienced unique ways to implement their knowledge. The FWFHP strongly believed in the social responsibility of nurses, to provide health care and health promotion to patients, specifically the overlooked and underserved in society (Connor et al., 2010). This community-academic partnership allowed the year-round services provided by MSFW health clinics to meet the needs of its patients even during peak growing and harvesting seasons when clinics would otherwise be overwhelmed by the numerous MSFW seeking care. Nursing, physical therapy, dental hygiene, and psychology students spent two weeks working in MSFW health clinics and allowed extended clinic hours (often sunset to midnight) and increased site locations (Connor et al., 2010). Students were trained and practiced providing care in a culturally appropriate manner.

The main goals of this program were to reduce barriers that MSFW face in accessing health care, to decrease health disparities between the MSFW population and the greater US population by inhibiting and minimizing advancement of disease states, and to produce culturally competent health care providers across various disciplines (Connor et al., 2010). Rather than require MSFW to come to clinics, the FWFHP utilized the extra help of student volunteers to provide health screening, physical exams, treatment for illnesses, health education, dental care, physical therapy, or psychological assessments wherever was most convenient for its patients, including community housing units or schools and day care sites for children (Connor et al.,

2010). Additionally, MSFW children received help in completing health-related documents in order to transition through the school system. Team members visited MSFW in their homes, assessed the environment and living conditions, and asked quality control questions (e.g. cleanliness of running water, electricity and sewage) (Connor et al., 2010). The FWFHP had various community partnerships including a university school of nursing, summer education programs, local businesses, faith communities, child care centers, and many others (Connor et al., 2010).

The FWFHP was shown to provide numerous benefits to the community during the fifteen years it has been in effect in Atlanta, GA. Through this longstanding partnership, the program has demonstrated commitment to the community and gained its trust (Connor et al., 2010). Undergraduate students have learned to acknowledge and respect the culture and traditions of their patients and incorporate these unique qualities as they provide health care. The program was designed to be adapted depending on the needs of the community through flexible hours and locations. Students also learned how to interact with patients through a translator.

No formal research has been conducted to evaluate the effectiveness of the FWFHP. However, because the FWFHP was developed and structured for a very specific and unique demographic, it is more likely to effectively meet the needs of its patients (Connor et al., 2010). The community and academic partnerships further strengthened the program and ensured longevity. One limitation to the program's propagation was the need for interpreters for almost all health students and professionals. Even if team members spoke Spanish, having a native Spanish-speaker who also personally understood the culture and lifestyle of MSFW was an irreplaceable asset on the team. Another weakness of the FWFHP was the short two-week duration per student volunteer. Unless a volunteer participated in the program multiple times, it

was unlikely that he or she spent enough time to truly feel comfortable and develop therapeutic relationships with patients. Despite these minimal limitations, the FWFHP had made strides to better meet a broad spectrum of medical needs within the MSFW community of Atlanta, GA.

Similar to the FWFHP, the Migrant Family Health Program (MFHP) also provided a two-week immersion experience for students studying nursing and other health fields. Each summer, students and faculty from Georgia State University left their urban university setting and experienced the rural lifestyle of MSFW and their families (Wilson et al., 2000). The MFHP also utilized collaborations with multiple community programs including the county health department, county migrant education and health programs, local physicians and hospitals, etc. (Wilson et al., 2000).

The MFHP specifically sought to meet the medical and health needs of children by partnering with the local school system. Many schools held clinics in the school gymnasium where children received a variety of health screens and educational materials. All children who attended gymnasium clinics received a goody bag filled with basic hygiene materials and a toy. These goody bags functioned to encourage attendance, promote happiness, reinforce lessons, and to provide the materials needed to employ lessons learned during the clinic (Wilson et al., 2000). Focus groups with children sought to identify topics of highest priority to address during educational sessions. From these focus groups, sessions were developed to educate children on basic hygiene, smoking risks, dental care, nutrition, and basic body information (Wilson et al., 2000).

Aside from clinics held in schools, the MFHP also visited families in their homes. Team members educated MSFW and their families on common adult and childhood illnesses and pesticide poisoning prevention (Wilson et al., 2000). Various strategies were employed in order

to communicate educational material including: lectures, discussions, video and poster presentations, handouts and games (Wilson et al., 2000).

While formal research on effectiveness of the MFHP is lacking, an evaluation performed by the MFHP has reported that the implementation of preventative behaviors such as dental hygiene and basic nutrition, especially iron-rich foods, have positively affected MSFW children since the program's genesis (Wilson et al., 2000). Stakeholders agreed that the program has increased the quality of primary care available to MSFW as well as access to such care (Wilson et al., 2000). Furthermore, students and faculty who participated as team members gained knowledge of MSFW needs and competence in working with this unique community (Wilson et al., 2000).

Another powerful program is the use of *Promotores de Salud*, or Health Promoters. Numerous counties in North Carolina and Virginia employ *Promotores de Salud* to reach approximately 13,500 MSFW and their families at health clinics each year (Gentry et al., 2007). *Promotores* are men and women within the MSFW community who network through their references and social circles to recruit participants to attend health care clinics and other sources of care within their community (Gentry et al., 2007). These bilingual and bicultural workers served to bridge the gap that frequently exists between health care workers from outside the community and MSFW (Bauer & Kantayya, 2010). *Promotores* utilized their unique role and connections within the community to educate, communicate and promote attendance to health care clinics (Gentry et al., 2007). In order to grow more familiar with health and wellness and better reach and advocate for the MSFW community, *Promotores* received regular education on topics such as healthy eating, adolescent sexuality, and substance abuse (Bauer & Kantayya, 2010). In addition to the benefits for MSFW, utilizing *Promotores* developed leaders and

community advocates within the MSFW community rather than bringing outside resources into this unique population (Bauer & Kantayya, 2010).

Empowering individuals to implement behaviors that promote health and improve nutritional status is imperative. In 2014, Quandt, Grzywacz, Trej & Acury organized interviews in order to describe a model of nutritional strategies of child feeding in North Carolina farmworker families. Thirty-three mothers in MSFW families with children ages 2-5 years old were interviewed by bilingual Hispanic interviewers trained in public health and qualitative, in-depth interviewing. The goal of data collection was to further understand the beliefs, values, and environmental factors that dictate MSFW families' methods of procuring food, using food, and maintaining food security. Many factors needed to be considered because, as Figure 2 demonstrates, environmental factors, resources, and contextual factors affected families' nutritional strategies, and therefore nutritional status of children (Quandt et al., 2014). Understanding nutritional strategies will allow further development of intervention programs among MSFW and their families.

Quandt et al. (2014) discovered that procurement of food largely consisted of purchasing raw materials to prepare at home. Most families reported a preference for Walmart stores due to low prices and the ability to shop for a variety of needed items in one place, although many MSFW camps were extremely rural and at least one hour away from the nearest Walmart store. Gardens were rare, but some families owned chickens for eggs and meat. High cost and distance minimized families' restaurant outings. Time was reported as a significant obstacle in the procurement of food, especially during peak planting and harvesting seasons when MSFW work especially long hours (Quandt et al., 2014).

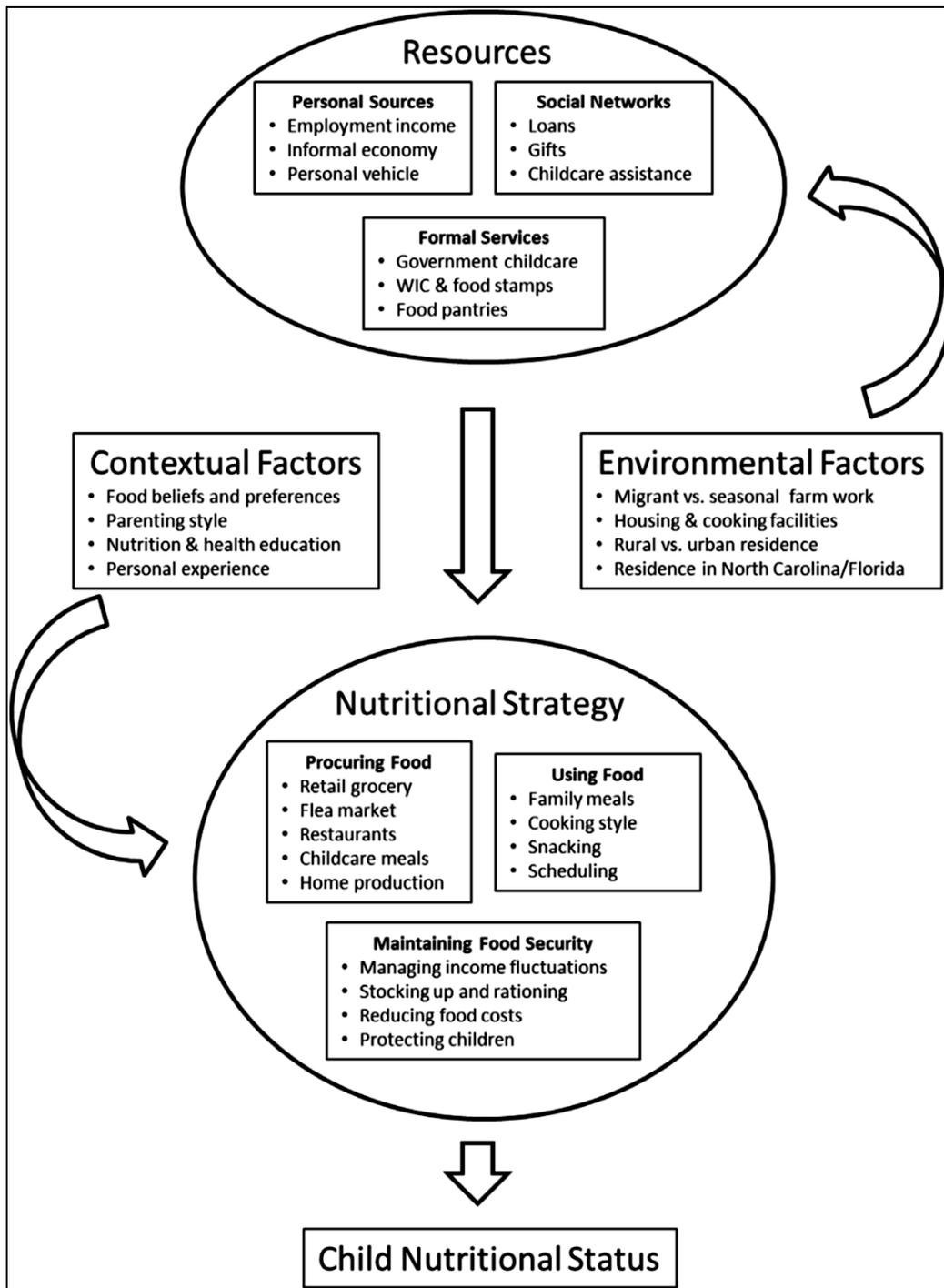


Figure 2. Conceptual model of nutritional strategy of child feeding in farmworker families. From Quandt et al., 2014, pg. 74

Related to food procurement, food use was very simple and consisted of meals prepared at home from scratch. The most commonly purchased processed foods included sugar-sweetened beverages and snack foods (Quandt et al., 2014). Although the majority of families intended to prepare meals from scratch, many faced difficulties within MSFW camps because most camps provided only one kitchen for multiple families. Limited space to cook and store food inhibited families' ability to prepare meals as desired (Quandt et al., 2014).

Child-directed and parent-directed approaches to feeding were both reported among MSFW families. Parents who employed a child-directed approach allowed children to lead the eating process. Parents prepared specific foods that the child enjoyed or asked for and served the food when the child was hungry. This approach was believed to help children learn hunger and satiety cues and therefore prevent overweight and obesity (Quandt et al., 2014). In contrast, the parent-centered approach involved the promise of rewards for eating, threatening no treats if the meal was not eaten, and insisting that children eat when the rest of the family ate. This approach was far more common (Quandt et al., 2014).

Parents reported various strategies to maintain food security regardless of income and other variables. Parents prioritized providing their children with three meals per day, even if it meant eating less or not at all so that children had enough to eat. When extra money was available in the budget, families often bought non-perishable food items or bulk items to ration. Families who participated in the Supplemental Nutrition Assistance Program (SNAP) reported always having enough money for food. Unfortunately, only children born in the United States are eligible for SNAP. Many MSFW families sought food from food banks, food pantries, and churches (Quandt et al., 2014).

Quandt et al. (2014) translated the description of child feeding practices among MSFW families to a model for identifying various leverage points to be focused on in order to improve the health and nutrition of these children. Programs and interventions can be developed to reach MSFW families in light of the thorough explanation of environmental factors, resources, and contextual factors impacting nutritional strategies depicted in Figure 2. These details should be taken into consideration when conceptualizing potential interventions among MSFW families.

While local agencies and health clinics can influence the health and well-being of MSFW and their families, it is imperative that farm owners step into active roles in promoting the health of the workers they employ. A 2012 farm owner survey found that 36% of farm owners self-reported limited knowledge of health care options available to MSFW (Kilanowski, 2012). A farm owner who is well-educated and familiar with health services that exist specifically for MSFW and their families has the power to positively impact the individuals and families that work in his fields. Almost half (45%) of farm owners surveyed already promoted various health services to their employees, including migrant health clinics, onsite and mobile migrant clinics, connections with local health care professionals, immunization clinics, and health promotion by public or private agencies (Kilanowski, 2012).

Effectiveness of Strategies

Kilanowski & Lin (2013) devised a pilot intervention study in order to determine the effect of instructional sessions administered to Latina migrant farmworker mothers on two outcomes: children's BMI and dietary intake and mothers' pre- and post-intervention nutrition knowledge. An internet search was used to locate Midwest farms that employed migrant workers, and farm growers were contacted with recruitment letters, flyers and posters. Latina MSFW mothers of children 2 to 12 years old living in an agricultural work camp were eligible

for the study. Upon consent of mothers and assent of children ages 8 years and older, participants were enrolled in the study. Group sites were predetermined as intervention or comparison sites based on location and proximity to other sites. Baseline data were collected from participants including: questionnaires and surveys to assess the mother's acculturation, food security, and self-efficacy. The survey also assessed the child's food frequency and anthropometric data.

Both intervention and comparison groups participated in two data collection sessions: once at the beginning of the study and again three months later, after the health promotion interventions had ended (Kilanowski & Lin, 2013). The comparison group received informational handouts on healthy eating from the Centers for Disease Control and Prevention. The intervention group, however, participated in three additional instructional sessions including the following topics: nutrition knowledge of fruits and vegetables, food portions, whole grains and canola and olive oil; suggestions on increasing physical activity and decreasing screen time; and selection of healthy snacks, reading food labels, limiting sugar-sweetened beverages, and encouraging family meals and daily breakfast (Kilanowski & Lin, 2013). At each session, mothers received a tool to reinforce the lesson such as a jump rope to encourage physical activity or a cookbook to promote healthy family meals (Kilanowski & Lin, 2013). A healthy meal, snacks and beverages were provided at each session, along with childcare.

Many healthful improvements were observed among the intervention group. Mean maternal nutrition knowledge significantly increased from baseline to the end of the study (Kilanowski & Lin, 2013). The largest improvement in nutrition knowledge was observed among mothers with lowest levels of acculturation. Among children whose mothers participated in the intervention group, a trend from obese to normal BMI was observed as well as a decrease in percentage of obese and overweight children. In contrast, the change in BMI for children in the

comparison group was not statistically significant, although a trend from normal to overweight was observed. Unfortunately, no improvement was observed for either the intervention or comparison groups in reaching the USDA guidelines for any food group.

The strengths of this study include relevant and meaningful questionnaires, intervention session topics, and measurement tools. Limitations of this study include differences in baseline characteristics between intervention and comparison groups not considered in assessment. Predetermination of intervention and comparison sites did not allow for randomization of study participants. Furthermore, low attendance (only 33% of participants attended 100% of sessions) reported in this pilot study limited the study's validity and suggested very low feasibility of a future multidata collection study (Kilanowski & Lin, 2013). Low attendance caused a loss of statistical power, especially when missed sessions were data collection points. Inherent to the use of food frequency questionnaires is human error and forgetfulness, which is magnified in this situation by asking mothers to report on children's food intake.

Since very little research currently exists on programs and interventions among MSFW, literature describing similar programs among US children at large can be used as a reference point. In 2009, Birch and Ventura reviewed studies which implemented an obesity intervention in order to analyze the commonalities and effectiveness of current strategies in diminishing or reversing the obesity epidemic across the nation. Most primary intervention approaches possessed similar characteristics including: being conducted in schools; using school-aged children and adolescents; and considering many components at once such as change in dietary patterns, increased physical activity, decreased sedentary behavior, and reduced weight or weight gain. However, negligible results were found among half of these interventions, reporting no

significant change among outcome variables. In fact, the most rigorously designed studies tended to be least effective (Birch & Ventura, 2009).

Many factors contribute to the ecological framework that dictates child weight, primarily the intake and expenditure of individual children. However, these habits are impacted by familial, community, and demographic characteristics (Birch & Ventura, 2009). These numerous factors must all be considered when addressing child weight. According to the NHANES report from 2014, over 20% of 2-5 year olds were already overweight or at risk of becoming overweight (Ogden et al., 2014). Within the first five years of a child's life, parenting and environment can predispose children to be at risk of becoming overweight, especially as children transition from suckling to consuming an adult-like diet. Birch & Ventura (2009) suggested that these data promote the idea that an obesity intervention should occur before children are school-aged, when food preferences and hunger and satiety cues are first being learned. This idea can also be applied to MSFW families.

Infants are born with a preference for sweet flavors and an aversion for sour and bitter flavors (Birch & Ventura, 2009). A preference for salty flavors develops around four months of age. Infants are predisposed to reject new flavors and display neophobia when introduced to new foods or flavors. When combined with infants' aversion for bitter foods, neophobia can increase parents' difficulty in introducing new foods to their children, especially vegetables. Breastfeeding has been shown to minimize food aversion and increase preference for vegetables. A 26-day longitudinal study conducted in the Midwest observed 36 infants as new foods and flavors were introduced to them. Infants who had been breastfed displayed less neophobia and showed a higher preference for new foods, compared to formula-fed infants (Birch & Ventura, 2009). Breast milk created a "flavor bridge" to help infants adjust and develop a preference for a

variety of flavors. In light of this data, MSFW clinics should encourage mothers to breastfeed in order to minimize neophobia and promote a preference for vegetables in infants.

As a result of examining current interventions, Birch & Ventura (2009) developed guidelines for appropriate feeding practices of infants and a multiphase strategy for developing interventions to prevent obesity among children. Both guidelines can be utilized in clinics as teaching tools for parents of young children and to develop strategies for reaching them. Appropriate feeding practices were fourfold: (1) to familiarize children with healthy foods; (2) for parents and peers to model eating healthy foods; (3) to pair healthy foods with positive contexts; and (4) to teach children to adhere to internal cues such as hunger and satiety rather than external cues from parents to regulate intake (Birch & Ventura, 2009). These feeding practices have been designed to capitalize on the fragile and impressionable state of infants as they learn to consume an adult-like diet. Using these feeding practices as a foundation, obesity interventions can be developed based on the multiphase strategy proposed by Birch & Ventura (2009). The first phase of development, called the “screening phase,” should consist of experiments guided by theories in order to identify pertinent intervention components. Second, in the “refining phase,” components from phase one should be refined and a secondary experiment should follow. Finally, the “confirming phase” consists of evaluating the intervention components of the refining phase and optimizing components to create a finalized experiment (Birch & Ventura, 2009). This strategy can be manipulated for application in various environments, including among MSFW.

Birch & Ventura (2009) identified common factors consistent among current obesity interventions for children. Presumably one of the greatest obstacles for these school-based interventions is the prevalence of overweight and obese children upon entry into school. Birch &

Ventura (2009) postulated that intervening with children before age five will increase the effectiveness of obesity interventions and have a life-long impact on eating habits due to the rapid learning of food preferences that occurs during infancy. Guidelines for appropriate feeding practices and strategy development are key for implementing obesity interventions among infants and can easily be transferred to the MSFW context.

Like Birch and Ventura, Watkins, Larson, Harlan & Young (1990) also valued the developmental period that occurs in the first five years of a child's life as well as in-utero. A proposed intervention implemented at a MSFW clinic sought to increase prenatal visits, prenatal care in the first trimester, and use of well-child services. Sociodemographic, physical, nutritional, and psychological information was collected for 395 pregnant women and 560 children ages 0-5 years, all of whom received primary care from Tri-County Community Health Center in North Carolina from 1985 to 1987. Data were gathered from health records and supplemental interviews when needed. Staff of the intervention included two public health nurses, one public health nutritionist, and one social worker. Of these, three were bilingual or trilingual in English, Spanish and Haitian-Creole, greatly easing communication between the health care team and MSFW mothers (Watkins et al., 1990).

Staff conducted home visits and hospital visits, administered immunizations, and provided educational materials and basic health services (Watkins et al., 1990). Additionally, health education training was provided for women who stood out as leaders and helpers among their peers. Forty-two women completed a series of training sessions regarding healthy practices and utilization of health services. Completion of the program included a presentation to peers summarizing information learned. Four women were eventually elected to the board of directors at the Migrant Head Start Center and three others were employed on staff (Watkins et al., 1990).

This program was successful in improving several of its intended outcomes. In addition to enhancing the relationship between health care professionals and MSFW mothers, number of annual visits increased in almost all cases. Both the number of women who sought prenatal care during the first trimester and those who made at least nine visits during their pregnancy increased over the three year span of the intervention. The proportion of women who breastfed their infants increased from 31% to 52%, and children averaged three clinic visits per year throughout the intervention. However, a decrease in clinic visits was observed in infants and one-year-olds as well as an increase in preventative care and a decrease in diarrhea incidence. It was assumed that a correlation existed in these cases (Watkins et al., 1990).

This program's success serves as a testament to the importance of adequate health care professionals and translation capabilities. The intervention took advantage of a pivotal period during a child's life: from conception to age five. In this way, mothers and children both benefited from the intervention. Furthermore, the development of lay health advisors created a positive perpetuating cycle of women educating their peers regarding health and nutrition.

Appropriate and tangible presentation and materials are imperative for any program or intervention. With this in mind, Kilanowski (2013) conducted various focus groups with Latina MSFW mothers regarding health education materials in order to determine their preferences concerning nutrition and health education as well as strengths and weaknesses of current materials and approaches. A total of 31 women with children ages 2-13 years old participated in one of four 60-minute focus groups located in migrant camps in Michigan and Ohio (Kilanowski, 2013). Focus groups were advertised through preexisting community liaisons and held in community rooms, barns, or a school trailer, depending on availability. Each focus group was moderated by a Spanish-speaking Latina woman familiar with Mexican and migrant culture.

All sessions were recorded using two digital voice recorders. Moderators thoroughly debriefed session content immediately upon termination. Participants completed a demographic questionnaire in order to determine baseline characteristics.

Kilanowski utilized adult learning theories and cultural care theories in order to address materials and presentation mediums including auditory, DVD, pamphlets, visual food replicas, and the Food Pyramid (Kilanowski, 2013). Entirely auditory educational materials such as stories and radio or musical presentations were not well received by mothers. Common complaints were the short amount of time to listen to and retain the information presented. DVD presentation, however, created an enjoyable environment in which most participants were well engaged. Many commented that they felt more capable of retaining the information from the DVD format. Serving size food replicas surprised mothers of what a single serving size is. However, most women did not consider changing habits in order to minimize servings. Food Pyramid *chalupa*, a Mexican-style Bingo game, was very successful among all participants as a culturally appropriate and fun game which engaged participants in a unique way while encouraging learning and interaction. Participants appreciated take-home pamphlets that documented the information discussed during the educational session. Mothers welcomed the ability to review and reference the materials presented even weeks after the session (Kilanowski, 2013).

Kilanowski also discovered various guidelines for materials to be developed in the future. Pamphlets should be colorful and attractive, not only to catch the attention of mothers, but also children since mothers were encouraged to teach their children what they have learned (Kilanowski, 2013). Because participants often took more than one in order to share the information with friends, it is important for pamphlets to be able to stand alone and be understood without the context of the educational session. A balance between descriptive

pictures and words should be sought. Participants reported a preference for materials in English and Spanish for various reasons, including the ability for mothers to learn English, the sharpening of children's Spanish skills, and the difficulty of parents to read English while their children could not read Spanish. Additionally, when using auditory or DVD materials, participants responded very positively to dramatic story lines with gossip undertones similar to soap operas (Kilanowski, 2013). These findings should be considered when selecting or developing health and nutrition educational materials to be presented to MSFW and their families.

Summary and Future Research

MSFW represent a unique niche in the United States. These men and women live under harsh conditions, engage in long hours of physically demanding labor, and receive insufficient income. The undocumented status prevalent among MSFW creates an environment of fear and instability. Most attempt to avoid recognition of any kind for fear of deportation. This social seclusion blocks MSFW and their families from society and its services, including access to health care. Injury and medical needs are often neglected unless allowed to progress to a debilitating concern. Even then, MSFW rarely know where they can access health care, rarely possess insurance, and are often stranded due to lack of transportation. Furthermore, language and cultural barriers interfere with receiving care since MSFW may not be able to communicate the problem or understand a medic's consultation.

Children of MSFW are especially at risk of disease, particularly related to poor nutrition. Food insecurity among the MSFW population deprives children of high quality macronutrients necessary for energy and muscle synthesis as well as essential vitamins and minerals required for proper growth and development. Children of MSFW are disproportionately affected by obesity,

dental issues, eye and ear risks, cardiovascular disease, anemia, mental health problems, various infections and communicable diseases as compared to all US children.

Throughout the country, programs are being developed in an effort to provide MSFW and their families with quality health care and education. Health care clinics designed specifically for MSFW have the opportunity to specialize care, location, and hours of operation in order to best serve the community. Programs such as the FWFHP and the MFHP employ students in health fields to provide supplementary care to these clinics during times of peak planting and harvest when clinics often reach capacity. Use of *Promotres de Salud* (Health Promoters) as language and cultural translators as well as community advocates improves interactions between health care professionals and MSFW. Additionally, farm owners themselves should be knowledgeable regarding health care services available to MSFW and their families. Specific guidelines have been developed for use and creation of health and nutrition education materials intended for MSFW and their families.

Little research has been conducted to understand environmental factors, resources, and contextual factors that impact the nutrition strategy of MSFW and its influence on children's nutritional status. While various programs exist to reach the MSFW population, their impact remains minimal. Thousands of MSFW in the United States receive no medical attention or health and nutrition education. Although more research is needed regarding their effectiveness, programs such as the FWFHP and the MFHP should be expanded throughout the United States. University students in all health professions should be utilized in health clinics in rural areas. As shown through the FWFHP and the MFHP, all parties involved benefited from students' time in clinics. In this way, clinics will increase their capacity to care for MSFW and their families year-round, and health care professionals who are culturally aware and competent will be developed.

More research is needed to fully understand the MSFW population's nutritional strategy in order to further develop intervention programs.

Intervention among farm owners is also needed. Farm owners are a unique resource to MSFW for many reasons including understanding of local culture, English-speaking, and especially, potential knowledge of local health clinics accessible to MSFW. However, a shockingly low percentage of farm owners self-reported knowledge and propagation of health care available to those working in their fields. Training and educating farm owners regarding health care available to MSFW in their area has the potential to eliminate the barrier to health related to lack of knowledge. Healthier workers would benefit farm owners as well since workers would have more energy, less pain, and more of a personal connection with the farm owner. MSFW would likely be even more productive if able to access the medical attention and nutrition education they need.

Following the model provided by Kilanowski & Lin (2013), instructional sessions including nutrition education and strategies to increase physical activity and decrease screen time should be implemented in MSFW clinics. These sessions should aim to increase nutrition knowledge of mothers as a means to improve child health. The first five years of children's lives should be targeted as prime intervention points. Because most children are already overweight, obese, or at risk overweight by the time they enter school, obesity interventions that target school-aged children are largely corrective. Preventative obesity interventions can take place with mothers and children from conception to age five, when the mother has more complete control over what the child eats and the child develops food preferences learns hunger and satiety cues. The multiphase strategy for developing obesity interventions by Birch & Ventura (2009) and the guidelines for using and developing educational materials for MSFW by Kilanowski

(2011) can be referenced throughout the process of intervention generation. Prenatal care and well-child exams should be prioritized during this time as well.

Regarding research needs, many published articles were found concerning MSFW in the mid-west and southern parts of the United States, but very little was discovered concerning MSFW in the western United States. While one can assume that conditions and needs are likely similar across the country, more research is needed to determine how the life of MSFW and their families may differ throughout the country. Findings respecting demographics, housing, education, nutrition, illness, and programs in place to address such issues may drastically alter development of strategies to appease observed dilemmas. Little research exists regarding current interventions and strategies and their effectiveness. More research is needed to provide an accurate picture of the current state of the MSFW population in order to respond appropriately.

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